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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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CONLEY ROSE, P.C.
David A. Rose
P. O. BOX 3267
HOUSTON, TX 77253-3267

EXAMINER	
EJAZ, NAHEED	

ART UNIT	PAPER NUMBER
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/865,238	AHMED ET AL.	
	Examiner	Art Unit	
	Naheed Ejaz	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 28 September 2007.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-23 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-23 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-23 have been considered but are moot in view of the new ground(s) of rejection.

Response to Amendment

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 9, 11 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of Sudo et al. (6,944,119) (hereinafter, Sudo) and further in view of Harley et al. (7,197,243) (hereinafter, Harley).

4. As per claim 1, AAPA discloses in (Fig. 2) a communications receiver that comprises: an analog-to-digital converter (26) that samples a DMT (discrete multi-tone) signal to obtain a digital receive signal; a transform module (34) coupled to the analog-to-digital converter and configured to determine amplitudes associated with frequency components of the digital receive signal (Pg. 2, lines 1-8, Pg. 5, lines 19-24).

AAPA does not teach detection module configured to determine channel symbol from the amplitudes while accounting for correlation between the amplitudes.

Sudo teaches a reception processing which includes determination section 112 (figure 5, col.5, lines 15-24) which determines symbol synchronization (col.5, lines 29-51) (claimed 'detection module configured to determine a channel symbol') which is based on the correlation processing (figures 3 & 19, element 1501, col.5, lines 56-65) (claimed 'accounting for correlation').

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Sudo into AAPA in order to detect FFT processing start timing and prevent desynchronization as taught by Sudo (col.6, lines 13-16).

AAPA and Sudo do not teach correlation between frequency component amplitudes explicitly.

Harley teaches peak detector which is used to identify frequency amplitudes based on correlation computations (figure 5, col.14, lines 36-65) (claimed 'correlation between the frequency component amplitudes of the digital receive signal').

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Harley into AAPA and Sudo in order to select frequency range which is immune to periodic interference thus improve performance of a system as taught by Harley (col.15, lines 37-47).

5. As per claim 9, AAPA and Harley teach all the limitations in the previous claim on which claim 9 depends but fail to disclose transform module on the receive signal in each channel symbol interval.

Sudo teaches, 'transform module performs a fast Fourier Transform (FFT) on the receive signal in each channel symbol interval' (figure 5, elements 113, figures 4, 6, col.4, lines 27-29, col.5, lines 29-32 & 46-65).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Sudo into AAPA and Harley in order to detect FFT processing start timing and prevent desynchronization as taught by Sudo (col.6, lines 13-16).

6. Claim 11 is rejected under the same rationale as mentioned in the rejection of claim 1 above since it inherits all the limitations recited in claim 1.

7. As per claim 19, in addition to aforementioned rejection of claim 1, AAPA teaches all the limitations recited in the claim but fails to teach OFDM transmission and reception.

Sudo teaches, 'a transmitter that transmits an OFDM modulated signal (figure 1, elements 1-5, col.1, lines 16-22); and a receiver that receives and demodulates a corrupted version of the OFDM modulated signal' (figure 1, elements 6-14, col.1, lines 39-64).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Sudo into AAPA and Harley in order to detect FFT processing start timing and prevent desynchronization as taught by Sudo (col.6, lines 13-16).

8. Claims 2-5, 7, 12-18 & 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in views of Sudo et al.

(6,944,119) and Harley et al. (7,197,243), as applied to claims 1 and 11 above, and further in view of Aslanis et al. (6,359,933) (hereinafter, Aslanis).

9. As per claim 2, AAPA, Sudo and Harley teach all the limitations in the previous claim on which claim 2 depends but they fail to disclose determination of the most probable channel symbol given the amplitudes determined by the transform module.

Aslanis teaches, 'detection module determines the most probable channel symbol given the amplitudes determined by the transform module' (figure 1, elements 40, 60, 68, figure 2, element 90, col.3, lines 28-45, col.9, lines 35-39) (it is noted that in the mentioned columns and lines Aslanis transforms time domain values into complex amplitudes in the frequency domain by Fast Fourier Transform (FFT) (claimed 'the amplitudes determined by the transform module') (col.3, lines 29-31). Aslanis explains in figure 2 the function of decision unit 68 of figure 1 In figure 2, Aslanis teaches that decision unit 68 (col.7, lines 61-63) determines the best one of the correlation results whether it exceeds a resynchronization threshold (claimed 'detection module determines the most probable channel symbol') (col.9, lines 35-44).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Aslanis into AAPA, Sudo and Harley in order to provide an improved method of frame synchronization in a transmission system using multi-carrier modulation (col.2, lines 38-40) as taught by Aslanis.

10. As per claim 3, AAPA, Sudo and Harley teach all the limitations in the previous claim on which claim 3 depends but they fail to disclose weighted sum unit.

Aslanis teaches 'weighted sum unit associated with each frequency component, wherein each weighted sum unit combines a plurality of amplitudes from the transform module in a manner designed to minimize any error between the output of the weighted sum unit and a valid output value' (see paragraph # 3 above).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Aslanis into AAPA, Sudo and Harley in order to provide an improved method of frame synchronization in a transmission system using multi-carrier modulation (col.2, lines 38-40) as taught by Aslanis.

11. As per claim 4, AAPA, Sudo and Harley teach all the limitations in the previous claim on which claim 4 depends but they fail to disclose determination of channel symbol that corresponds to a matrix product.

Aslanis teaches, 'detection module (figure 1, element 60) determines the channel symbol that corresponds to a matrix product of a matrix M and a vector of amplitudes from the transform module, wherein the matrix M minimizes a square of an expected error between the channel symbol and valid channel symbols' (col.8, lines 59-67, col.9, lines 1-6).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Aslanis into AAPA, Sudo and Harley in order to provide an improved method of frame synchronization in a transmission system using multi-carrier modulation (col.2, lines 38-40) as taught by Aslanis.

12. As per claim 5, AAPA, Sudo and Harley teach all the limitations in the previous claim on which claim 5 depends but they fail to disclose subtraction module that removes trailing intersymbol interference.

Aslanis teaches in figure 1, 'a subtraction module (element 36) that removes trailing intersymbol interference from the output of the transform module (element 40) to obtain ISI-corrected frequency component values (column 5, lines 18-33); a decision unit (element 68) that determines a matrix product of a matrix M and a vector of ISI-corrected frequency component values to obtain the channel symbol; and a feedback module (element 70) that determines a matrix product of a matrix T and the channel symbol from the decision unit to provide the trailing intersymbol interference to the subtraction module' (column 10, lines 62-67, col.11, lines 1-17).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Aslanis into AAPA, Sudo and Harley in order to provide an improved method of frame synchronization in a transmission system using multi-carrier modulation (col.2, lines 38-40) as taught by Aslanis.

13. As per claim 7, AAPA, Sudo and Harley teach all the limitations in the previous claim on which claim 7 depends but they fail to disclose a cyclic prefix remover.

Aslanis teaches, 'a cyclic prefix remover that removes prefixes from the digital receive signal, each prefix being associated with a respective channel symbol' (col.5, lines 21-29).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Aslanis into AAPA, Sudo and Harley in order

to provide an improved method of frame synchronization in a transmission system using multi-carrier modulation (col.2, lines 38-40) as taught by Aslanis.

14. Claim 12 is rejected under the same rationale as mentioned in the rejection of claim 2 above since Aslanis teachings suggest that in order to determine the best one of the correlation results requires to identify the best result first which would read on the claim limitations (see claim 2 rejection above).

15. Claim 13 is rejected under the same rationale as mentioned in the rejection of claim 3 above.

16. As per claim 14, in addition to aforementioned rejection of claim 1 above, Aslanis teaches, 'determining a product of a matrix M and the set of frequency component amplitudes, wherein the matrix M includes at least two non-zero values in each row' (col.8, lines 29-58) (it is noted that Aslanis does not explicitly teach matrix that has at least two non-zero values in each row. However, it is well known in the art that complex multiplication involves a using a matrix and weights that are being used for transmission and have a non-zero coefficients which would read on claim limitations).

17. Claim 15 is rejected under the same rationale as mentioned in the rejection of claim 5 above.

18. As per claim 16, AAPA teaches in figure 2, 'processing the receive signal to shorten the effective channel impulse response (element 28, Specification, page # 6, paragraph # 0027, lines 2-3) before performing said determining a set of frequency component amplitudes' (element 34, Specification, page # 6, paragraph # 0027, lines 5-7).

19. Claim 17 is rejected under the same rationale as mentioned in the rejection of claim 7 above.

20. As per claim 18, AAPA teaches, 'converting the receive signal into digital form' (figure 2, element 26), 'performing a fast Fourier Transform on the digital receive signal' (figure 2, element 34).

21. As per claim 20, AAPA, Sudo and Harley teach all the limitations in the previous claim on which claim 20 depends but they fail to disclose determination of most probable channel symbol.

Aslanis teaches, 'determines the most probable channel symbol given the amplitudes determined by the transform module' (see claim 2 rejection above).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Aslanis into AAPA, Sudo and Harley in order to provide an improved method of frame synchronization in a transmission system using multi-carrier modulation (col.2, lines 38-40) as taught by Aslanis.

22. As per claim 21, AAPA, Sudo and Harley teach all the limitations in the previous claim on which claim 21 depends but they fail to disclose weighted sum unit.

Aslanis teaches 'weighted sum unit associated with each frequency component, wherein each weighted sum unit combines a plurality of amplitudes from the transform module in a manner designed to minimize any error between the output of the weighted sum unit and a valid output value' (see paragraph # 3 above).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Aslanis into AAPA, Sudo and Harley in order

to provide an improved method of frame synchronization in a transmission system using multi-carrier modulation (col.2, lines 38-40) as taught by Aslanis.

23. As per claim 22, AAPA, Sudo and Harley teach all the limitations in the previous claim on which claim 22 depends but they fail to disclose determination of channel symbol that corresponds to a matrix product.

Aslanis teaches, 'detection module (figure 1, element 60) determines the channel symbol that corresponds to a matrix product of a matrix M and a vector of amplitudes from the transform module, wherein the matrix M minimizes a square of an expected error between the channel symbol and valid channel symbols' (col.8, lines 59-67, col.9, lines 1-6).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Aslanis into AAPA, Sudo and Harley in order to provide an improved method of frame synchronization in a transmission system using multi-carrier modulation (col.2, lines 38-40) as taught by Aslanis.

24. As per claim 23, AAPA, Sudo and Harley teach all the limitations in the previous claim on which claim 23 depends but they fail to disclose subtraction module that removes trailing intersymbol interference.

Aslanis teaches in figure 1, 'a subtraction module (element 36) that removes trailing intersymbol interference from the output of the transform module (element 40) to obtain ISI-corrected frequency component values (column 5, lines 18-33); a decision unit (element 68) that determines a matrix product of a matrix M and a vector of ISI-corrected frequency component values to obtain the channel symbol; and a feedback

module (element 70) that determines a matrix product of a matrix T and the channel symbol from the decision unit to provide the trailing intersymbol interference to the subtraction module' (column 10, lines 62-67, col.11, lines 1-17).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Aslanis into AAPA, Sudo and Harley in order to provide an improved method of frame synchronization in a transmission system using multi-carrier modulation (col.2, lines 38-40) as taught by Aslanis.

25. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in views of Sudo et al. (6,944,119) and Harley et al. (7,197,243), as applied to claim 1 above, and further in view of Pal (6,353,629).

26. As per claim 6, AAPA, Sudo and Harley teach all the limitations in the previous claim on which claim 6 depends but they fail to disclose maximization of impulse response energy.

Pal teaches, 'a time domain equalizer that operates on the digital receive signal to maximize a percentage of impulse response energy in a predetermined interval' (col.6, lines 48-52) (it is noted that in the mentioned column and lines Pal is maximizing the ratio of energy of the channel impulse response and that would maximize the percentage value of the energy of the channel impulse response as well since percentage would depend on the maximized values of the ratio of energy).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Pal into AAPA, Sudo and Harley in order to

improve the convergence and effectiveness of the time domain equalizer (col.6, lines 48-56) as taught by Pal.

27. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in views of Sudo et al. (6,944,119) and Harley et al. (7,197,243), as applied to claim 1 above, and further in view of Kumar (5,748,677).

28. As per claim 8, AAPA, Sudo and Harley teach all the limitations in the previous claim on which claim 8 depends but they fail to disclose error correction code decoder.

Kumar teaches an error correction code decoder that decodes channel symbols received from the detection module in order to make the bit error rate of the decoded bit sequence substantially lower that of the estimated bit sequence (col.10, lines 44-67, col.11, lines 1-5 & 15-25).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Kumar into AAPA, Sudo and Harley in order to lower the bit error rate of the decoded bit sequence and enhance the system reliability (col.11, lines 15-25) as taught by Kumar.

29. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in views of Sudo et al. (6,944,119) & Harley et al. (7,197,243) and further in view of Mahoney (6,360,369).

30. As per claim 10, in addition to aforementioned rejection of claim 1, AAPA, Sudo and Harley teach all the recited limitations in the claim, Harley teaches match filter detection in the frequency domain in order to provide superior performance in terms of

noise removal (figure 5, col.13, lines 51-62) (claimed transform module includes bank of matched filters). AAPA, Sudo and Harley fail to disclose bandpass filters.

Mahoney teaches detection of symbol that has circuitry which includes FFT (claimed transform module) and bandpass filter bank (figure 3, elements 207, 308, 311, 313, figure 4, elements 404, 410) (claimed transform module includes a bank of bandpass filters).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to incorporate bandpass filters of Mahoney into AAPA, Sudo and Harley circuitries so that the interference (ingress) is removed without reducing the data rate or changing the frequency of the signal as taught by Mahoney (col.3, lines 48-53).

Contact Information

31. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Naheed Ejaz whose telephone number is 571-272-5947.

The examiner can normally be reached on Monday - Friday 8:00 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on 571-272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Naheed Ejaz
Examiner
Art Unit 2611

11/30/2007

NE

CHIEH M. FAN
SUPERVISORY PATENT EXAMINER